REMARKS

Attorney for applicant appreciates the Examiner pointing out the error in claim 37. The underlining was removed from claim 37.

As previously stated in the non-compliant amendment, the applicant respectfully requests reconsideration in view of the following remarks. The applicant has amended claim 1 by further limiting the catalyst. The applicant has amended claim 36 to have the catalyst require only two metals. Support for newly added claim37 can be found in the original claim 1. The applicant has corrected the process step of claim 9. The applicant has amended claims 23 and 30. Support for amended claims 23 and 30 can be found in claims 23 and 30. No new matter has been added.

Claims 1 and 3-24 and 28-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bjerrum et al. WO 01/18894 A2 (Bjerrum) in view of Buchanan et al. US 5,759,944 (Buchanan). Claims 2 and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bjerrum et al WO 01/18894 A2 in view of Buchanan et al. US 5,759,944 as applied to claim 1 and 3-24 and 28-34 above and in further view of Kiefer et al. US 2005/0084727 A1 (Kiefer). The applicant respectfully traverses these rejections.

The instant invention is directed to a membrane electrode unit (MEU) comprising

A) at least one polymer membrane which includes at least one polymer with at least one nitrogen atom, the polymer membrane including at least one mineral acid,

B) at least two electrodes,

wherein at least one electrode includes a catalyst containing

i. at least one precious metal of the platinum group, and/or at least one precious metal Au and/or Ag and

ii. at least Ni.

The Examiner points out that claim 1 would be obvious over (i) Bjerrum in view of Buchanan, (ii) Bjerrum, and Buchanan in view of Kiefer.

Bjerrum discloses MEU having a polymer electrolyte membrane (PEM) over-lapping with the PEM as currently claimed. Bjerrum teaches membranes of the present type as claimed under A) above.

Further, Bjerrum teaches to use alloyed catalyst based on Pt and Pt/Cr, Pt/Ti, Pt/W **but does not disclose/teach a catalyst of Pt/Ni alloy**. The Examiner acknowledges that Bjerrum does not disclose catalyst based on Ni (see the top of page 4 of the office action). Buchanan

Buchanan discloses MEU having an acid electrolyte, which is not a polymer electrolyte membrane (PEM) overlapping with the PEM as currently claimed. In particular, Buchanan teaches that instead of phosphoric acid fuel cells (PAFC) solid polymer fuel cell (SPFC) based on perfluorosulphonic acid is used (see col. 2, lines 48-55).

PEM based on perfluorosulphonic acid are for low temperature fuel cells and not for HT. Sulphonic acid requires the presence of water for being proton conductive. Thus, PEM based on perfluorosulphonic acid and PAFC are not being functionally equivalent. This is the same analogy that a diesel engine and a gas engine serve the same function but are different types of technology. The applicant believes that the Examiner is taking a very general view on functional equivalence.

Phosphoric acid fuel cells (PAFC) are a type of fuel cell that uses liquid phosphoric acid as an electrolyte. The acid being present is liquid phosphoric whereas the phosphoric acid is present as acid/base blend (the polymer having an N-heterogroup is an alkaline polymer) and the acid is present as complex not as liquid.

Further, Buchanan teaches to use alloyed catalyst based on Pt or Pt/alloy and Au (gold). It is true that Buchanan lists various alloy metals which form the Pt/alloy, including one or more of Ti, Cr, Mn, Fe, Co, Ni, Cu, Ga, Zr and Hf (see col. 1, lines 60-67).

From this listing, the Examiner concludes that Ti and Ni are considered to be functionally equivalent. Therefore, according to the Examiner, one would exchange the Ti in the Pt/Ti alloy known from Bjerrum by Ni as taught by Buchanan.

However, the Examiner still ignores that:

a) Buchanan relates to acid electrolyte which are not polymer as currently claimed;

b) If one would consider the electrolytes being "similar/equivalent", the teaching of Buchanan is to use catalyst based on Pt or Pt/alloy and Au (gold). In other words, the teaching is to use gold in combination with the acid electrolyte to increase the performance (the applicant claims require metal of the platinum group, or gold and not the combination of a platinum group metal **AND** gold;

c) Comparative Examples 1 and 2 vs. Examples 3 and 4 in Buchanan are showing that the performance is only increased if gold is present in the catalyst system, thus Pt/Ni are NOT recommended for acid electrolyte.

Buchanan mentions Pt/Ni alloy for acid electrolyte but links this teaching to gold as further required catalyst component.

As mentioned before, the Kiefer does not contribute anything going beyond the teaching of Buchanan (phosphoric acid electrolyte systems) and Bjerrum (polyazole/phosphoric acid system).

Kiefer relates to proton conductive membranes based on a polymer film (polyazole) which is doped with vinyl-**phosphonic** acid monomers (liquid or solution). The Examiner will note in the phosphoric acid the phosphorous atom is in oxidation number (V) whereas phosphonic acid the phosphorous atom is in oxidation number (III).

The PEM taught by Kiefer is based on polyazole but does not contain a mineral acid (such as phosphoric acid). It is true that in paragraph no. [0126] it is mentioned that the liquid in step a) may comprise phosphoric acid.

However, there is no teaching provided by Kiefer that alloyed catalysts, especially based on an alloy with nickel, improve the performance of the MEA. Therefore, there is no teaching provided by Kiefer which measures have to be taken to improve the performance of a catalyst for polyazole/phosphoric acid PEM.

Claim 37 is directed to a polymer membrane as consisting of a polymer with at least one nitrogen atom and a mineral acid. This claim excludes the organic acid (vinyl acid) and the polymerized vinyl acids.

Unexpected Results

An object of the instant invention is to provide a catalyst system having improved performance for polyazole (polymer with at least one nitrogen atom)/mineral acid (phosphoric acid) systems.

The instant inventors found that by using Pt/Ni catalysts higher power densities can be drawn from such MEU (see page 35 of the instant specification and examples).

Starting from Bjerrum, the person of ordinary skill in the art knows that non-alloyed and alloyed catalyst based on Pt and Pt/Cr, Pt/Ti, Pt/W are suitable for such polymer electrolyte systems.

Bjerrum teaches that alloys made of Pt/Ru provide improved tolerance against carbon monoxide (CO) which is a poison for Pt catalysts, in particular for DMFC. There is no teaching provided by Bjerrum which steps have to be taken to improve the performance of a catalyst for polyazole/phosphoric acid PEM. In particular, there is no teaching for Pt/Ni alloy catalyst is provided.

This shortcoming of Bjerrum, according to the Examiner, should be overcome by combining Buchanan and Kiefer.

However, the teaching of Buchanan for acid electrolytes (which are liquids of phosphoric acid, typically in a SiC matrix absorbed) is to use Au (gold) as Pt/Ni/Au catalyst rather than using the comparative examples Pt/Ni. In contrast, Buchanan teaches away from using the comparative examples Pt/Ni for acid electrolytes. Again, in the applicant's view the Examiner picks individual elements from Buchanan and combines them while already knowing the solution to the instant problem. Therefore, a person of ordinary skill in the art would not combine the isolated features known from a different teaching, namely to use gold as catalyst component, to combine them in a new manner.

A statement that modifications of the prior art to meet the claimed invention would have been "obvious to one of ordinary skill in the art at the time the invention was made" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). See MPEP § 2143.01 IV. "[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1396 (2007) quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). Furthermore, the Examiner cannot selectively pick and choose from the disclosed parameters without proper motivation as to a particular selection. The mere fact that a reference may be modified to reflect features of the claimed invention does not make the modification, and hence the claimed invention, obvious unless the prior art suggested the desirability of such modification. *In re Mills*, 916 F.2d 680, 682, 16 USPQ2d 1430 (Fed. Cir. 1990); *In re Fritch*, 23 USPQ2d 1780 (Fed. Cir. 1992). Thus, it is impermissible to simply engage in a hindsight reconstruction of the claimed invention where the reference itself provides no teaching as to why the applicant's combination would have been obvious. *In re Gorman*, 933 F.2d 982, 987, 18

USPQ2d 1885, 1888 (Fed. Cir. 1991). For the above reasons, these rejections should be withdrawn.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

No additional fee is due. Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 15588-00042-US from which the undersigned is authorized to draw.

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Respectfully submitted,

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